

Impact of a Regional U.S. Drought on Land and Atmospheric Carbon



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Regional droughts affect vegetation productivity, thereby reducing the amount of carbon absorbed by the land biosphere and increasing the amount of CO₂ remaining in the atmosphere. They can also influence local and remote weather, which may further affect CO₂.

Question: How large are these effects?

We used NASA GMAO's Global Earth Observing System (GEOS) Earth System Model to gain a mechanistic understanding of the connection between regional droughts and atmospheric CO₂. In our simulations, we impose an idealized 3-month spring drought over the lower Mississippi River Valley.

As shown in this image, vegetation productivity in the drought area was reduced by 23% (*left column*). Anomalous atmospheric CO₂ (*right column*) extended over an area three times larger than the imposed drought due to atmospheric transport, but changes were small and near the limit of what can be detected by current satellites.

Improved understanding of the impact of droughts provides scientists with more knowledge of the processes that control carbon flux and how they manifest themselves in satellite observations (e.g., OCO-2, OCO-3, and the upcoming GeoCarb).

